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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/077,258	02/14/2002	Brian Sze-Ki Mo	018865-001010US	5261
20350	7590	06/15/2004	EXAMINER	
TOWNSEND AND TOWNSEND AND CREW, LLP			HUYNH, YENNHU B	
TWO EMBARCADERO CENTER			ART UNIT	
EIGHTH FLOOR			PAPER NUMBER	
SAN FRANCISCO, CA 94111-3834			2813	

DATE MAILED: 06/15/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/077,258

Applicant(s)

MO ET AL.

Examiner

Yennhu B. Huynh

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 January 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) 9-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 9-15 and 17 is/are rejected.
- 7) ☒ Claim(s) 16 and 18 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 1/29/04 has been entered.

Claims 1-8 are cancelled by the Preliminary Amendment filed on 2/14/02.

Currently, claims 9-18 are pending.

Oath/Declaration

Oath/Declaration filed on 2/14/02 is accepted.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 9 -14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Benedict et al. (US. 6,046,487).

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Benedict discloses a shallow trench isolation with oxide nitride/oxynitride liner, which include:

-Re. claims 9,13 & 14: forming a trench 16 in a silicon on a substrate 10 (fig. 1A, 2A col. 2 lines 62-65); heating the substrate at 770 C degrees to form a first layer of SiO at 10nm (= 100 Angstroms) thick inside the trench (1B, 2B); forming a conformal layer of SiN 42 about 10nm (=100 Angstroms), and growing a second layer of oxide 44 is about 5-10nm (= 50-100 Angstroms) (fig. 2a, col. 3 lines 45-67).

However, Benedict do not disclose wherein the substrate heating at 1,100 C degrees.

The heating temperature of the substrate at 1,100 C degrees is considered to involve routine optimization while has been held to be within the level of ordinary skill in the art, As noted In re Aller 105 USPQ233, 255 (CCPA 1955). the selection of reaction parameters such as temperature and concentration would have been obvious.

Normally, it is to be expected that a change in temperature, or in concentration, or in both, would be an unpatentable modification. Under some circumstances, however, changes such as these may impart patentability to a process if the particular ranges claimed produce a new and unexpected result, which is different in kind, and not merely in degree from the results of the prior art. In re Dreyfus, 22 CCPA (Patents 830,73 F.2d 931, 24 USPQ 52; In re Waite et al., 35CCPA (Patents) 1117, 168F.2d 104, 77 USPQ 586. Such ranges are termed "critical" ranges, and the applicant has the burden of proving such criticality. In re Swenson et al., 30 CCPA (Patents) 809, 132 F.2d 1020, 56 USPQ 372; In re Scherl, 1193, 156 F.2d, 70 USPQ 204. However, even through applicant's modification results in great improvement and utility over the prior art, it may still not be patentable if the modification was within the capabilities of one skilled in the art. In re Sola, 22 CCPS (Patents) 1313, 77 F.2d 627, 25 USQ 433; In re Normann et al., 32 CCPA (Patents) 1248, 150 F.2d 708, 66 USPQ 308; In re Irmischer, 32 CCPA (Patents) 1259,150 F.2d 705, 66 USPQ 314. More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. In re Swain et al. 33 CCPA (Patents) 1250, 156 F. 2d239, 70 USPQ 412; Minnesota Mining and Mfg. Co. v. Coe, 69 App. D.C. 217, 99 R.2d 986, 38 USPQ 214; Allen et al. v. Coe, 77 App. D.C 324, 135 F.2d 11, 57 USPQ 136.

Benedict et al. also disclose

-Re. claim 10: forming a second oxide layer 44 on the silicon nitride layer 42 (fig. 2B col.3 & 4 lines 59 – 8).

-Re. claim 11: wherein the layer of silicon nitride is 10nm (equivalent to 100 Angstroms).

-Re. claim 12: wherein the layer of silicon nitride is a conformal layer of silicon nitride formed using a LPCVP (col.3 lines 50-52).

Claims 15 & 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Benedict et al. (US. 6,046,487) in view of Fujii et al. (U.S. 4,774,556).

Benedict et al. disclose substantially all of the claimed features, but do not disclose a conductive gate material filling the trench (claims 15 & 17); a body layer on the substrate having opposite conductivity type, wherein the trench extending through and into the substrate (claims 16 & 18)

-Re. claims 15&17: Fujii disclose a non-volatile semiconductor memory device, which include conductive gate material 62 & 64 (fig. 15) filling the trench; wherein the first SiO/SiN layer 5, conformer SiO layer 42, second SiO 42 together form the gate dielectric layer of the trench (fig. 16 & 16 col.9 lines 10-30).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine Fujii et al.'s conductive gate material filling the trench together form the gate dielectric layer of the trench, into Benedict et al., to obtain a

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trench transistor type having small scale structure wherein the transistor occupied in trench for the MOSFET semiconductor device.

Allowable Subject Matter

Claims 16 & 18 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is an examiner's statement of reasons for allowance: Fujii et al., disclose a body layer 2 N+ conductivity type on the substrate 1 and being of opposite to the P+conductivity type substrate 1. Jujii also disclose wherein the trench extending through the body 2, but Fujii do not disclose wherein the trench extending into the substrate, to obtain electrically connection from the surface of the trench through into the diffusion region of the transistor, in the substrate.

The above limitation for claims 16 & 18 are neither anticipated nor rendered obvious over the prior art of record.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

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.Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Yennhu B Huynh whose telephone number is 571-272-1692. The examiner can normally be reached on 8.30AM-7.00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr., can be reached on 571-272-1702. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-7724.

YNBH,
5/26/04


CARL WHITEHEAD, JR.
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800